

## CLAIMS

1. A liquid detoxification method for purifying liquid by removing microbes in untreated liquid, said method comprising steps for:

applying a mechanical treatment to said liquid for damaging microbes therein to thereby kill microbes,

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said liquid and injecting the substance into said liquid to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said liquid; and

storing treated liquid into a tank for treated liquid.

2. The liquid detoxification method according to claim 1,

wherein said chlorination is performed in a electrolytic circulation system in which all or part of said liquid is introduced into a storing tank and circulated through a circulation line between said storing tank and an electrolyzer for electrolyzing said liquid thereby to obtain chlorine-containing substance.

3. The liquid detoxification method according to claim 1, further comprising a step for:

applying at least one of an active-carbon treatment using active carbons and a metal-catalytic treatment to said liquid after said mechanical treatment and chlorination.

4. A liquid detoxification method for purifying liquid by removing microbes in untreated liquid, said method comprising steps for:

applying a microbe-separation treatment by filtration or centrifugal separation for removing comparatively large microbes present in said liquid, said filtration being performed by running said liquid through a filter or the like;

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said liquid and feeding said chlorine-containing substance into said liquid to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said liquid; and

storing treated liquid into a tank for treated liquid.

5. The liquid detoxification method according to claim 4, further comprising a step for

applying a mechanical-treatment to said liquid for damaging microbes therein thereby to kill microbes before or after said step for applying a microbe-separation treatment.

6. A detoxification method for purifying seawater by removing microbes in untreated seawater, said method comprising steps for:

applying a mechanical treatment to said seawater for damaging microbes therein to thereby kill microbes,

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said seawater and injecting said substance into said seawater to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said seawater; and

storing treated seawater into a tank for treated seawater.

7. The detoxification method according to claim 6,

wherein said chlorination is performed in an electrolytic circulation system in which all or part of seawater is introduced into a storing tank and circulated through a circulation line between said storing tank and an electrolyzer for electrolyzing said seawater thereby to obtain chlorine-containing substance.

8. The detoxification method according to claim 6,  
wherein natural energy such as solar battery and a wind power is used as an electric source for said chlorination.

9. The detoxification method according to claim 6,  
1, further comprising a step for  
applying at least one of an active-carbon treatment using active carbons and a metal-catalytic treatment to seawater after said mechanical treatment and chlorination.

10. A detoxification method for purifying untreated seawater by removing microbes in untreated seawater, said method comprising steps for:

applying a microbe-separation treatment by filtration or centrifugal separation for removing comparatively large microbes present in said seawater, said filtration being performed by running said seawater through a filter or the like;

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said seawater and adding the substance into said seawater to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said seawater; and  
storing treated seawater into a ballast water tank.

11. The detoxification method according to claim 6,  
1, further comprising a step for

applying a mechanical-treatment to said seawater for damaging microbes in said seawater thereby to kill microbes before or after said step for applying a microbe-separation treatment.

12. A detoxification apparatus for purifying liquid by removing microbes in untreated liquid containing untreated seawater, said apparatus comprising:

a mechanical treatment unit for applying a mechanical treatment to said liquid by damaging microbes in said liquid to thereby kill microbes,

either one of oxidization means or chlorination means, said oxidization means adding oxidizing substance to said liquid and said chlorination means feeding chlorine-containing substance formed from said liquid to said liquid thereby to kill microbes; and

a tank for treated liquid for storing said treated liquid after being treated in said mechanical treatment unit and said oxidization means or chlorination means.

13. The detoxification apparatus for purifying liquid according to claim 12,

wherein said chlorination means has a liquid electrolytic unit being configured to apply chlorination being performed in an electrolytic circulation system in which all or part of said liquid is introduced into a storing tank and circulated through a circulation line between said storing tank and an electrolyzer for electrolyzing said liquid thereby to obtain chlorine-containing substance.

14. The detoxification apparatus for purifying liquid according to claim 12, further comprising:

a residual-chlorine meter for measuring the level of residual chlorine in treated seawater to which said chlorination was applied;

wherein said chlorination means control the amount of the chlorine-containing substance to be produced based on the residual chlorine level measured by said residual-chlorine meter.

15. A detoxification apparatus for purifying liquid by removing microbes in untreated liquid containing untreated seawater, said apparatus comprising:

a microbe-separation unit by filtration or centrifugal separation for removing comparatively large microbes present in said liquid, said filtration being performed by running said liquid through a filter or the like;

either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said liquid and feeding said substance into said liquid to thereby kill microbes, and said oxidization means adding oxidizing substance to said liquid; and

a tank for storing treated liquid.

16. The detoxification apparatus for purifying liquid according to claim 15, further comprising:

a mechanical treatment unit for applying a mechanical treatment to said liquid to damage and kill microbes present in said liquid before or after said microbe-separation unit.

17. A detoxification method for purifying seawater by removing microbes in seawater stored in a ballast water tank, said method

comprising steps for:

applying a mechanical treatment to said seawater for damaging microbes therein to thereby kill microbes,

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said liquid; and

discharging treated seawater out of said ballast water tank.

18. A detoxification method for purifying seawater by removing microbes in seawater stored in a ballast water tank, said method comprising steps for:

applying a mechanical treatment to said seawater for damaging microbes therein to thereby kill microbes,

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said liquid; and

circulating said seawater to said ballast water tank.

19. The detoxification method according to claim 17 or 18, wherein natural energy such as solar battery and a wind power is used as an electric source for said chlorination.

20. The detoxification method according to claim 17 or 18, wherein said chlorination is performed in an electrolytic circulation system in which all or part of said seawater stored in said ballast water tank is introduced into a storing tank and

circulated through a circulation line between said storing tank and an electrolyzer for electrolyzing said seawater thereby to obtain chlorine-containing substance.

21. The detoxification method according to claim 17 or 18, further comprising a step for:

applying at least one of an active-carbon treatment using active carbons and a metal-catalytic treatment to said seawater after said mechanical treatment and chlorination.

22. A detoxification method for purifying seawater by removing microbes in seawater stored in a ballast water tank, said method comprising steps for:

applying a microbe-separation treatment by filtration or centrifugal separation for removing comparatively large microbes present in said seawater, said filtration being performed by running said seawater through a filter or the like;

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said seawater and feeding said chlorine-containing substance into said seawater to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said seawater; and

discharging treated seawater out of said ballast water tank.

23. A detoxification method for purifying seawater by removing microbes in seawater stored in a ballast water tank, said method comprising steps for:

applying a microbe-separation treatment by filtration or centrifugal separation for removing comparatively large microbes



present in said seawater, said filtration being performed by running said seawater through a filter or the like;

applying either one of chlorination or oxidization, said chlorination being performed by producing chlorine-containing substance from said seawater and feeding said chlorine-containing substance into said seawater to thereby kill microbes, and said oxidization being performed by adding oxidizing substance to said seawater; and

circulating said seawater to said ballast water tank.

24. The detoxification method for purifying seawater according to claim 22 or 23, further comprising a step for

applying a mechanical-treatment to said seawater for damaging microbes in said seawater thereby to kill microbes before or after said step for applying microbe-separation treatment.

25. The detoxification method for purifying seawater according to claim 22 or 23,

wherein said chlorination is performed in an electrolytic circulation system in which all or part of said seawater stored in said ballast water tank is introduced into a storing tank and circulated through a circulation line between said tank and an electrolyzer for electrolyzing said seawater thereby to obtain chlorine-containing substance, and said microbe separation treatment is performed to said seawater chlorinated in said electrolytic circulation system.

26. The detoxification method for purifying seawater according to claim 22 or 23,

wherein said chlorine-containing substance is composed by



chlorine, sodium hypochlorite, sodium chlorite, chloric acid, or their ions or sodium chloride.

27. A detoxification apparatus for purifying seawater stored in a ballast water tank by removing microbes in seawater, said apparatus comprising:

a mechanical treatment unit for applying a mechanical treatment to said seawater by damaging microbes therein to thereby kill microbes; and

either one of chlorination means or oxidization means, said chlorination means feeding chlorine-containing substance formed from said seawater to said seawater thereby to kill microbes and said oxidization means adding oxidizing substance to said seawater; and

wherein said seawater previously treated in said mechanical treatment unit and chlorination means or oxidization means is discharged out of said ballast water tank.

28. A detoxification apparatus for purifying seawater stored in a ballast water tank by removing microbes in seawater, said apparatus comprising:

a mechanical treatment unit for applying a mechanical treatment to said seawater by damaging microbes therein to thereby kill microbes; and

either one of chlorination means or oxidization means, said chlorination means feeding chlorine-containing substance formed from said seawater to said seawater thereby to kill microbes and said oxidization means adding oxidizing substance to said seawater; and

wherein said seawater previously treated in said mechanical

treatment unit and chlorination means or oxidization means is circulated to said ballast water tank.

29. The detoxification apparatus for purifying seawater according to claim 27 or 28,

wherein said chlorination means has a liquid electrolytic unit being configured to apply chlorination being performed in an electrolytic circulation system in which all or part of said seawater is introduced into a storing tank and circulated through a circulation line between said storing tank and an electrolyzer for electrolyzing said seawater thereby to obtain chlorine-containing substance.

30. The detoxification apparatus for purifying seawater according to claim 29,

wherein said liquid electrolytic unit is provided in downstream or upstream of said mechanical treatment unit.

31. The detoxification apparatus for purifying seawater according to claim 29,

wherein said liquid electrolytic unit is provided on said circulation line and composed to perform said chlorination in said electrolytic circulation system.

32. The detoxification apparatus for purifying seawater according to claim 29, further comprising:

a residual-chlorine meter for measuring the level of residual chlorine in seawater stored in said ballast water tank;

wherein said chlorination means control the amount of the chlorine-containing substance to be produced by said electrolytic

circulation system based on the residual chlorine level measured by said residual-chlorine meter.

33. A detoxification apparatus for purifying seawater stored in a ballast water tank by removing microbes in seawater, said apparatus comprising:

a microbe-separation unit by filtration or centrifugal separation for removing comparatively large microbes present in said seawater, said filtration being performed by running said seawater through a filter or the like;

either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization means adding oxidizing substance to said seawater; and

wherein said seawater previously treated in said microbe-separation unit and chlorination means or oxidization means is discharged out of said ballast water tank.

34. A detoxification apparatus for purifying seawater stored in a ballast water tank by removing microbes in seawater, said apparatus comprising:

a microbe-separation unit by filtration or centrifugal separation for removing comparatively large microbes present in said seawater, said filtration being performed by running said seawater through a filter or the like;

either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization means adding oxidizing

substance to said seawater; and

wherein said seawater previously treated in said microbe-separation unit and chlorination means or oxidization means is circulated to said ballast water tank.

35. The detoxification apparatus for purifying seawater according to claim 33 or 34, further comprising

a mechanical treatment unit for applying a mechanical treatment to said seawater to damage and kill microbes present therein in downstream or upstream of said microbe-separation unit.

36. A detoxification apparatus for purifying seawater by removing microbes present in seawater, comprising:

an on-land detoxification facility being placed on land for killing microbes in said seawater;

a ballast water tank being mounted on a ship;

a seawater intake line for taking in seawater into said on-land detoxification facility; and

a seawater discharge line for feeding said seawater treated in said on-land detoxification facility to said ballast water tank;

wherein a microbe-extinction treatment for killing microbes is applied to said seawater introduced into said on-land detoxification facility via said intake line, and said treated seawater is stored into said ballast water tank via said discharge line.

37. The detoxification apparatus for purifying seawater according to claim 36,

wherein said on-land detoxification facility comprises:

either one of chlorination means or oxidization means, said

chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization means adding oxidizing substance to said seawater; and

a mechanical treatment unit for applying a mechanical treatment to said seawater by damaging microbes therein to thereby kill microbes, and

wherein said seawater treated in said chlorination means or oxidization means and said mechanical treatment unit is stored into said ballast water tank via said discharge line.

38. The detoxification apparatus for purifying seawater according to claim 36,

wherein said on-land detoxification facility comprises:

either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization means adding oxidizing substance to said seawater; and

a microbe-separation unit by filtration or centrifugal separation for removing comparatively large microbes present in said seawater, said filtration being performed by running said seawater through a filter or the like; and

wherein said seawater treated in said chlorination means or oxidization means and said microbe-separation unit is stored into said ballast water tank via said discharge line.

39. The detoxification apparatus for purifying seawater according to claim 36,

wherein said on-land detoxification facility is either one

of chlorination means or oxidization means when an on-board detoxification facility mounted on said ship is a mechanical treatment unit, or said on-land detoxification is said mechanical treatment unit when said on-board detoxification facility is either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, said oxidization means adding oxidizing substance to said seawater, and said mechanical treatment unit applying a mechanical treatment to said seawater by damaging microbes therein to thereby kill microbes,

wherein said seawater treated in said on-land detoxification facility is fed to said on-board detoxification facility via said seawater discharge line, and said seawater treated in said on-board detoxification facility is stored in said ballast water tank.

40. The detoxification apparatus for purifying seawater according to claim 36,

wherein said on-land detoxification facility is either one of chlorination means or oxidization means when an on-board detoxification facility mounted on said ship is a microbe-separation unit, or said on-land detoxification is said microbe-separation unit when said on-board detoxification facility is either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, said oxidization means adding oxidizing substance to said seawater, and said microbe-separation unit removing comparatively large microbes present in said seawater by centrifugal separation or filtration which is performed by running said seawater through a

filter or the like, and

wherein said seawater treated in said on-land detoxification facility is fed to said on-board detoxification facility via said seawater discharge line, and said seawater treated in said on-board detoxification facility is stored in said ballast water tank.

41. The detoxification apparatus for purifying seawater according to claim 40, further comprising

a seawater intake line provided on board which has an inlet opening to the sea and is connected to said mechanical treatment unit or microbe-separation unit,

wherein, when said on-land detoxification unit is either said chlorination means or oxidization means, said mechanical treatment unit or microbe-separation unit applies mechanical treatment or microbe separation to said seawater treated in said on-land detoxification unit and seawater introduced via said seawater intake line.

42. The detoxification apparatus for purifying seawater according to claim 36, further comprising

a carrier such as a vehicle for mounting said on-land detoxification facility thereon and moving freely on land.

43. A detoxification apparatus for purifying seawater by removing microbes present in seawater, comprising:

an at-sea detoxification facility being placed on the sea for killing microbes in said seawater;

a ballast water tank being mounted on a ship;

a seawater intake line for taking in seawater into said at-sea detoxification facility; and



a seawater discharge line for feeding said seawater treated in said at-sea detoxification facility to said ballast water tank;

wherein a microbe-extinction treatment for killing microbes is applied to said seawater introduced into said at-sea detoxification facility via said intake line, and said treated seawater is stored into said ballast water tank via said discharge line.

44. The detoxification apparatus for purifying seawater according to claim 43,

wherein said at-sea detoxification facility comprises:

either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization means adding oxidizing substance to said seawater; and

a mechanical treatment unit for applying a mechanical treatment to said seawater by damaging microbes therein to thereby kill microbes, and

wherein said seawater treated in said chlorination means or oxidization means and said mechanical treatment unit is stored into said ballast water tank via said discharge line.

45. The detoxification apparatus for purifying seawater according to claim 43,

wherein said at-sea detoxification facility comprises:

either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, and said oxidization means adding oxidizing

substance to said seawater; and

a microbe-separation unit by filtration or centrifugal separation for removing comparatively large microbes present in said seawater, said filtration being performed by running said seawater through a filter or the like; and

wherein said seawater treated in said chlorination means or oxidization means and said microbe-separation unit is stored into said ballast water tank via said discharge line.

46. The detoxification apparatus for purifying seawater according to claim 43,

wherein said at-sea detoxification facility is either one of chlorination means or oxidization means when an on-board detoxification facility mounted on said ship is a mechanical treatment unit, or said at-sea detoxification is said mechanical treatment unit when said on-board detoxification facility is either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, said oxidization means adding oxidizing substance to said seawater, and said mechanical treatment unit applying a mechanical treatment to said seawater by damaging microbes therein to thereby kill microbes,

wherein said seawater treated in said at-sea detoxification facility is fed to said on-board detoxification facility via said seawater discharge line, and said seawater treated in said on-board detoxification facility is stored in said ballast water tank.

47. The detoxification apparatus for purifying seawater according to claim 43,

wherein said at-sea detoxification facility is either one of chlorination means or oxidization means when an on-board detoxification facility mounted on said ship is a microbe-separation unit, or said on-land detoxification is said microbe-separation unit when said on-board detoxification facility is either one of chlorination means or oxidization means, said chlorination means producing chlorine-containing substance from said seawater and feeding said substance into said seawater to thereby kill microbes, said oxidization means adding oxidizing substance to said seawater, and said microbe-separation unit removing comparatively large microbes present in said seawater by centrifugal separation or filtration which is performed by running said seawater through a filter or the like, and

wherein said seawater treated in said at-sea detoxification facility is fed to said on-board detoxification facility via said seawater discharge line, and said seawater treated in said on-board detoxification facility is stored in said ballast water tank.

48. The detoxification apparatus for purifying seawater according to claim 46, further comprising

a seawater intake line provided on board which has an opening to the sea and connected to said mechanical treatment unit,

wherein, when said at-sea detoxification unit is either said chlorination means or oxidization means, said mechanical treatment unit applies mechanical treatment to said seawater treated in said at-sea detoxification unit and seawater introduced via said seawater intake line.

49. The detoxification apparatus for purifying seawater according to claim 46, further comprising

a seawater intake line provided on board which has an opening to the sea and connected to said microbe-separation unit,

wherein, when said at-sea detoxification unit is either said chlorination means or oxidization means, said microbe-separation unit applies microbe separation treatment to said seawater treated in said at-sea detoxification unit and seawater introduced via said seawater intake line.

50. The detoxification apparatus for purifying seawater according to claim 37,

wherein said chlorination means has a liquid electrolytic unit being configured to apply chlorination being performed in an electrolytic circulation system in which all or part of said seawater is introduced into a storing tank and circulated through a circulation line between said storing tank and an electrolyzer for electrolyzing said seawater thereby to obtain chlorine-containing substance.